LEONT'YEV, A.F.

A functional equation. Izv. AN SSSR. Ser. mat. 29 no.4:725-756 '65. (MIRA 18:9)

L 11622-66 EWT(d)/T IJP(c)

ACC NR: AP6001719

SOURCE CODE: UR/0020/65/165/004/0759/0762

AUTHOR: Leont'yev, A. F. 44,55

ORG: none

32
B

TITLE: Representation of arbitrary entire functions by Dirichlet series 16,44,55

SOURCE: AN SSSR. Doklady, v. 165, no. 4, 1965, 759-762

TOPIC TAGS: complex function, function analysis, series, convergent series

ABSTRACT: Results are presented relating to the representation of arbitrary entire functions of certain classes by Dirichlet series in the whole plane. An entire function $f(z)$ of order $\nu < \rho/(\rho-1)$ has the representation

$$f(z)=\sum_{m=1}^{\infty} f_m(z), \quad f_1(z)=\sum_{|\lambda_k|<r_1} P_k(z)e^{\lambda_k z}, \quad f_m(z)=\sum_{r_{m-1}<|\lambda_k|<r_m} P_k(z)e^{\lambda_k z}$$

$$(m>2).$$

The series converges absolutely and uniformly within the plane. Here

$$P_k(z)e^{\lambda_k z}=\frac{1}{2\pi i}\int_{C_k}\frac{\omega(\mu)e^{\mu z}d\mu}{L(\mu)} \quad (k=1,2,\ldots),$$

where

$$\omega_f(\mu)=\omega(\mu)=\sum_{n=1}^{\infty} c_n[f^{(n-1)}(0)+\mu f^{(n-2)}(0)+\ldots+\mu^{n-1}f(0)],$$

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UDC: 517.522.6

L 11622-66

ACC NR: AP6001719

and C_k is a closed contour enclosing λ_k and no other zero of $L(\lambda)$. The entire function $L(\lambda) = \sum_0^\infty c_n \lambda^n$ of order $\rho > 1$, satisfies the condition: there is a system of neighborhoods $|\lambda| = r_k, r_k \uparrow \infty$, such that $\ln|L(re^{i\varphi})| > r^{\rho-\varepsilon}$, $r = r_k$, $k > K(\varepsilon)$, and $\varepsilon > 0$ is arbitrary. The distinct zeros λ_1, λ_2, ... of $L(\lambda)$ are ordered in nondecreasing modulus and p_1, p_2, ... are the corresponding multiplicities. For any z,

$$\left|f(z) - \sum_{m=1}^{n} f_m(z)\right| < A(\varepsilon) e^{-r_n^{\rho-\varepsilon}} \exp|z|^{p+\varepsilon}, \quad p = \frac{\rho}{\rho-1} \quad (n = 1, 2, \ldots).$$

Other theorems are also given relating to simplified forms of f and to the rate of convergence of the series for f depending on further conditions on f and L. This paper was presented by academician Yu. V. Linnik on 19 April 1965. Orig. art. has: 30 equations.

SUB CODE: 12/ SUBM DATE: 08Apr65/ ORIG REF: 003

bck

Card 2/2

L 39881-66 EWT(d) IJP(c) GD-2

ACC NR: AP6016073 SOURCE CODE: UR/0039/65/067/004/0541/0560

AUTHOR: Leont'yev, A. F. (Moscow)

ORG: none

TITLE: Transformation of a functional equation to simpler form

SOURCE: Matematicheskiy sbornik, v. 67, no. 4, 1965, 541-560

TOPIC TAGS: mathematic transformation, functional equation

ABSTRACT: In this article the following general equation is considered:

$$\sum_{k=0}^{n} \int_{a}^{b} f^{(k)}(z + \xi)d\sigma_k(\xi) = 0,$$

where [a, b] is a segment of an imaginary axis, $\sigma_k(\xi)$ (k = 0, 1, ..., n) are functions of bounded variation in [a, b]. It is assumed that the function f(z) is defined and has continuous derivatives up to the order n inclusively in some interval (a_1, b_1) [a, b]. It is shown that this general equation may be transformed into the following equation:

$$\int_{a}^{b} f^{(k)}(z+\xi)d\sigma(\xi) = 0,$$

Card 1/2 UDC: 517.948

L 39881-66
ACC NR: AP6016073

where [a, b] is some interval of the imaginary axis, $\sigma(\xi)$ is the function of bounded variation in [a, b], f(z) is defined and continuous on the entire imaginary axis. The transformation is carried out and a number of theorems formulated and proved regarding the solutions of the simplified equation. Orig. art. has: 34 formulas. [JPRS]

SUB CODE: 12 / SUBM DATE: 16Mar64 / ORIG REF: 003

Card 2/2 LS

SOURCE CODE: UR/0039/66/071/001/0003/0013

ACC NR: AP7004543

LEONT'YEV, A. F. (Moscow)

ORG: none

TITLE: Representation of Integral Functions by Certain General Series"

Moscow, Matematicheskiy Sbornik, Vol 71, No 1, Sep 66, pp 3-13

TOPIC TAGS: integral function, Dirichlet problem

Abstract: An earlier article by the author dealt with the representation of arbitrary integral functions of a certain class by Dirichlet series. The present article deals with the representation of integral functions by more general series. The author takes the arbitrary integral function $F(z) = \sum_{n=0}^{\infty} b_n z^n$ of order ν satisfying the condition $\nu < \frac{\rho\rho_1}{\rho_1 - \rho}$. Two theorems are formulated and proved for the representation of function F(z) by a series which converges absolutely, and examples are given of their application. The proof is also given for the following fundamental relation:

$$F(z) - \frac{1}{2\pi i} \int_{|u|=r_k} \frac{\omega_F(u) f(uz)}{f(0) L(u)} du = \frac{1}{f(0)} \sum_{m=0}^{\infty} A_m^k(z) D^m F(0).$$

Orig. art. has: 5 formulas. [JPRS: 38,695]

SUB CODE: 12 / SUBM DATE: 15Apr65 / ORIG REF: 005

UDC: 517.535.4

Card 1/1

0736 1369

USSR / Pharmacology, Toxicology. Toxicology, Poisonous Plants.

Abs Jour: Ref Zhur-Biol., No 11, 1958, 85310.

Author : ~~Leont'yev, A.~~ G.
Inst : Stalinabad Medical Institute.
Title : Cases of Burns with Poisonous Plants.

Orig Pub: Sb. tr. Byuro gl. sudebnomed. ekspertizy i Kafedr. sudebn. med. i patol. anatomii Staliniabadsk. med. in-ta, 1956, No 5, 113-114.

Abstract: Description is given of two cases of medico-legal investigation of burns of the skin caused by the juice of poisonous plants. In one case there were burns on the skin of the foot, and in another, on the skin of the abdomen. The clinical picture was that of swelling, sharply-demarcated erythema, and yellowish blisters in the area of the burn.

Card 1/2

L 7934-66 EWT(1)/EWA(h)
ACC NR: AP5025646 SOURCE CODE: UR/0106/65/000/010/0038/0044

15
14
03

AUTHOR: Andreyev, V. S.; Leont'yev, A. G.

ORG: none

TITLE: Phase stability of harmonic frequency dividers 25

SOURCE: Elektrosvyaz', no. 10, 1965, 38-44

TOPIC TAGS: frequency divider, phase stability

ABSTRACT: The principal relations describing the operation of an electron-tube frequency divider (a sine-wave oscillator synchronized by a subharmonic of the external signal) show that any variation in the frequency or amplitude of the input signal or in the supply voltages results in a variation of the output phase of the divider. However, in the case of a regenerative frequency divider (a frequency converter, an amplifier, and a frequency-multiplier feedback), the attainable phase stability may be considerably higher; for small division ratios, the best

Card 1/2 UDC: 621.396.622.2:621.374.44

2

L 7934-66

ACC NR: AP5025646

phase stability is promised when a Hall generator is used as a converter. An experimental investigation of a 5 kc-to-1 kc electron-tube regenerative divider and a subharmonic-synchronized divider has corroborated the above theoretical conclusions. "V. G. Nosov took part in the experiments." Orig. art. has: 7 figures and 17 formulas.

SUB CODE: 09 / SUBM DATE: 07Oct64 / ORIG REF: 006

PC

Card 2/2

SOV/106-58-10-1/13

AUTHOR: A.G. Leont'yev

TITLE: The Possibility of Using a System of Orthogonal Functions for Communication Purposes (O vozmozhnosti ispol'zovaniya sistemy ortogonal'nykh funktsiy dlya tseley svyazi)

PERIODICAL: Elektrosvyaz', 1958, Nr 10, pp 3 - 8 (USSR)

ABSTRACT: The characteristic features of functions used as carriers in multichannel communication systems are periodicity and orthogonality. The author examines systems of Laguerre and Legendre orthogonal functions with a view to their application as communication carrier functions. Ageyev (Ref 1) showed that these functions have the most general character of functions which can be separated by linear methods. A Laguerre polynomial (Eq 2) of the n^{th} order is expressed as the solution of a differential equation with a variable parameter of the form given in Eq 3. Thus, to obtain Laguerre polynomials it is necessary to design a system with variable parameters, satisfying Eq 3. Further, Laguerre polynomes are orthogonal over an interval 0 to ∞ with a weight $e^{-\alpha t}$. To avoid generation of the weight $e^{-\alpha t}$ at the receiving end, the Laguerre polynomials them-

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selves are not used, but Laguerre functions, determined as $e^{-\frac{1}{2}\alpha t} L_n(\alpha t)$. The simplest way to obtain Laguerre functions is to transform a single pulse applied to the input of a four-terminal network. The characteristic of the four-terminal network can be obtained by use of the operator form of the Laguerre function (Eq 5). If the four-terminal network has an operator impedance of the given form, then, when a single pulse is applied to its input, the Laguerre function will be produced at its output. The circuit diagram is shown in Fig 1; Б are buffer cathode-followers. The author next considers the effect of integration within finite limits, instead of over an infinite range as theoretically required. Because the integration time is finite, it follows that the system will be of the pulse type. Two forms of modulation are possible: 1) amplitude, when each channel has its own function number, but the amplitude of the function changes from 'packet' to 'packet', depending on the change in the modulating function; 2) modulation of the order of the

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SOV/106-58-10-1/13

The Possibility of Using a System of Orthogonal Functions for Communication Purposes

polynomial, when a quantity n of Laguerre functions are allotted to each channel and the orders of the functions of the different channels do not overlap. Fig 3 shows the block diagram of an amplitude-modulated system. Still another system based on the orthogonality of the Laguerre function is possible, when the input signal is a Laguerre function of inverse time. Fig 4 gives the block diagram for such a system. Brief reference is made to experimental models and results. Professor A.A. Kharkevich, Corresponding Member of the AS of Ukrainian SSR, advised on this work. There are 4 illustrations and 6 references, 2 of which are Soviet.

SUBMITTED: May 30, 1958

Card 3/3

YUR'YEVICH, Yevgeniy Ivanovich; [illegible]T'YAN, A.G., red.

[Electromagnetic automatic control devices] Elektromagnitnye ustroistva avtomatiki. Moskva, Energiia, 1964. 414 p. (MIRA 17:11)

ANDREYEV, V.S.; LEONT'YEV, A.G.

Phase stability of harmonic frequency dividers. Elektrosviaz' 19 no.10:38-44 O '65. (MIRA 18:12)

1. Submitted Oct. 7, 1964.

L 16795-66 EWT(d)/EWP(l) IJP(c) BB/GG

ACC NR: AT6005080 SOURCE CODE: UR/2563/65/000/256/0111/0115

AUTHOR: Leont'yev, A.G.

39

ORG: none

B+1

TITLE: The choice of an optimum operation of the transmission cell based on the principle of current distribution

SOURCE: Leningrad. Politekhnicheskiy institut. Trudy, no. 256, 1965. Tsifrovyye izmeritel' nyye i upravlyayushchiye ustroystva (Digital measuring and control devices), 111-115

TOPIC TAGS: logic element, magnetic core

16,44

ABSTRACT: In the design of logical elements using the principle of current distribution (PCD) it is very important to utilize optimum core size and to select correct power supply voltages and cycling pulse parameters. For a logical structure of the element and given requirements, the solutions of the problem are not unique. The calculations can be made to optimize a) the volt-second capacitance of the cell; b) the power consumed by the cell; or c) the number of turns in the various coils. The present paper proposes

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and develops one of the possible methods for the calculation of logical PCD elements. The calculations yield the core cross section, core window, number of turns of the distributor and training coil, power supply voltage, and the amplitude and duration of cycling pulses. The theory is applied to the transmission cell example. Orig. art. has: 13 formulas and 4 figures.

SUB CODE: 09 / SUBM DATE: none

Card 2/2 SM

LEONT'YEV, A.I.

Effective method for preserving erythrocytes. Veterinariia 35 no.11:72-73 N '58. (MIRA 11:11)

(Erythrocytes)

GUDCHENKO, A.P., kand.tekhn.nauk; LEONT'YEV, A.I., inzh.

Determination of hydrogen content in aluminum alloys by the vacuum extraction method. Trudy MATI no. 49:137-159 '61. (MIRA 14:5)
(Aluminum alloys—Hydrogen content) (Vacuum metallurgy)

AKULOVA, M.F.; PANKOVA, G.Ye. mladshiy nauchnyy sotrudnik; TSUVERKALOV, D.A., prof.; LEONT'YEV, A.I.; POLYAKOV, D.K., kand.veter. nauk

Laboratory practive. Vete inariia 40 no.5:58-71 My '63. (MIRA 17:1)

1. Rostovskiy -na-Donu gosudarstvennyy nauchno-issledovatel'skiy protivochumnyy institut (for Akulova). 2. Vsesoyuznyy nauchno-issledovatel'skiy institut veterinarnoy virusologii i mikrobiologii (for Pankova, TSuverkalov). 3. Vsesoyuznyy nauchno-issledovatel'skiy institut veterinarnoy sanitarii (for Polyakov).

LEONT'YEV, A.I.

[redacted]

Analytical study of gas flow in cylindrical pipe with heat exchange. Inzh.-fiz.zhur. no.5:46-55 My '58. (MIRA 12:1)

1. Energeticheskiy institut AN SSSR, g. Moskva.
(Gas flow) (Heat--Transmission)

LEONT'YEV, A.I., kand.tekhn.nauk

Calculating the turbulent heat and mass exchange during a constant rate of drying. Nauch.trudy MLTI no.9:69-78 '58. (MIRA 11:12)

(Heat--Transmission) (Mass transfer)

LEONT'YEV, A.I., kand.tekhn.nauk

Thermodynamic study of gas flow in radiation-surface pipes of air boilers during a constant heat flow through the pipe walls. Nauch.trudy MLTI no.9:101-113 '58. (MIRA 11:12)
(Gas flow)

LEONT'YEV, A.I., kand.tekhn.nauk

Thermodynamic study of gas flow in a cylindrical pipe associated with heat and mass exchange. Nauch.trudy MLTI no.9:213-219 '58. (MIRA 11:12)

(Gas flow)

Leont'yev, A.I.

PHASE I BOOK EXPLOITATION SOV/3407

Akademiya nauk SSSR. Energeticheskiy institut im. G.M. Krzhizhanovskogo

Problemy energetiki; sbornik posvyashchayetsya akademiku G.M. Krzhizhanovskomu (Problems of Power Engineering; Collection of Articles Dedicated to Academician G.M. Krzhizhanovskiy) Moscow, 1959. 851 p. Errata slip inserted. 2,500 copies printed.

Eds. of Publishing House: B.D. Astrashin, P.V. Dobkov, P.I. Dubkov, and E.M. Moyzhes; Tech. Ed.: T.A. Prusakova; Editorial Board: A.V. Vinter, Academician (Deceased), V.I. Popkov (Resp. Ed.) Corresponding Member, Academy of Sciences USSR, V.I. Veyts, A.S. Predvoditelev, M.A. Styrikovich, K.F. Chukhanov, N.B. Bogdanova, Candidate of Technical Sciences, B.K. Kozlov, Candidate of Technical Sciences, M.M. Lebedev, Candidate of Technical Sciences, and L.E. Sandukov.

PURPOSE: This collection of articles is intended as a tribute to the memory of Academician G.M. Krzhizhanovskiy.

COVERAGE: The collection contains sixty articles by former students and coworkers of the deceased Academician. The articles deal with problems of a wide range of subjects in the field of power engineering: problems of the regional development of electrical and thermal power engineering, power engineering technology, and the physics of combustion. No personalities are mentioned. References are given after most articles.

28

SOV/96-59-3-14/21

AUTHORS: Kosterin, S.I., Doctor of Technical Sciences;
Kozhinov, I.A., Engineer and
Leont'yev, A.I., Candidate of Technical Sciences

TITLE: Pressure Pulsations in the Flow of Gas and Their Effect on Convective Heat-Exchange (Vliyaniye pul'satsiy davleniya v potoke gaza na konvektivnyy teploobmen)

PERIODICAL: Teploenergetika, 1959, Nr 3, pp 66-72 (USSR)

ABSTRACT: This article gives the results of theoretical and experimental investigations of convective heat-exchange in the presence of prolonged pressure pulsations in the gas flow. Very little theoretical or practical work has been done on the connection between external disturbances in the flow and the characteristics of the turbulent boundary layer. The first case to be considered theoretically is that of a turbulent boundary layer on a flat plate in the presence of periodic pulsations in the velocity of the main flow of gas. An integral equation for this case is first written, whence equation (15) is derived for the ratio of the resistance coefficient in the presence and absence of periodic

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velocity pulsations in the gas flows. The same equation can also be used to calculate the coefficients of heat- and mass-exchange under the same conditions. The case of a turbulent boundary layer in the initial section of a cylindrical tube is then considered in a similar manner. Formula (22) is derived for local values of the coefficients of friction in the initial section of the cylindrical tube: equations 23 and 24 are formulated for local and mean values of the Nusselt criterion. An experimental investigation is then described. This is particularly necessary because the semi-empirical method of calculation given above is based on assumptions that need verification. The experimental equipment is illustrated diagrammatically in Fig.1. Compressed air is heated to 400°C in an electric furnace and then passes through the experimental section of the equipment, after which it is discharged to atmosphere. Pulsations of pressure and velocity in the main flow of air were set up by means of a rotating disc which, together with the experimental section of the equipment, is illustrated in Fig.2. The experimental section consisted of a short cylindrical brass tube of 60 mm diameter fitted with calorimeter rings to measure heat flows. The first series of tests was made on a short tube. Temperature measurement from a number of the tests are presented graphically in Fig.3. It will be seen that the experimental points fall close to the theoretical straight lines. In addition to the measurement of the temperature distribution at the radius of the rings, measurements were made of the tube wall temperature under each ring; also of the profile of velocity and temperature at the inlet to and outlet from the experimental sections. Pressure variations were recorded oscillographically: some typical traces are reproduced in Fig.4. Drawings of the rotating disc used in these tests are given in Fig.5. The experimental figures obtained in the tests are tabulated: the range of Reynolds numbers was from 6.5×10^4 to 1×10^5, the air temperature was up to 400°C, the pressure pulsation

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Pressure Pulsations in the Flow of Gas and Their Effect on Convective Heat-Exchange

frequency was 900 c/s and the relative amplitude up to 0.536. It will be seen that there is an appreciable increase in the heat-transfer coefficients when pressure pulsations are present. In Fig.6 the test results are plotted to show the change of heat-transfer coefficient and wall temperature along the length of the model. These graphs also give the results of calculations of the distribution of heat-transfer coefficient by the procedure earlier described. It will be seen that there is satisfactory agreement between theory and experiment. The results of an experimental verification of the final criterial design formulae are given in Fig.7. This graph includes all the experimental points obtained in the tests. It follows that, within the range of the criteria obtained in the first part of the article and covered by the tests, the formulae offered for calculating convective heat-exchange in the

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SOV/96-59-3-14/21

Pressure Pulsations in the Flow of Gas and Their Effect on Convective Heat-Exchange

presence of pressure pulsations in the gas flow are in good agreement with the experimental data. There are 7 figures, 1 table and 6 references of which 2 are Soviet, 3 English and 1 German.

ASSOCIATION: Energeticheskiy institut AN SSSR (The Power Institute Ac.Sc.USSR)

Card 5/5

C5281
SOV/170-59-7-12/20

10(7)

AUTHOR: Leont'yev, A.I.

TITLE: A Study of One-Dimensional Gas Motion in a Cylindrical Channel at Sinusoidal Law of Heat Supply

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, 1959, Nr 7, pp 80 - 84 (USSR)

ABSTRACT: In a previous paper /Ref 1/ the author solved the problem of one-dimensional motion of gas in a tube at a constant heat flux along its length. The present paper represents an extension of that investigation for the case of sinusoidal law of heat supply, which can take place in the motion of gas along the channels of a gas-cooled atom reactor. The initial equation, Formula 1, is based on the equations and assumptions given in Reference 1. This equation is integrated on an electronic integrator of the MPT-9 type and the results are presented in Figures 1 and 2. For the case of low gas velocities the author gives an approximate analytical solution of Equation 1, and its results are compared with the rigorous results obtained on the integrator in Figure 3, which shows a satisfactory agreement for the region of small velocities. Furthermore, an expression is given for determining the temperature of the channel wall, Formula 10. A conclusion

Card 1/2

KUTATELADZE, S.S.; LEONT'YEV, A.I.

Turbulent friction on a flat plate in supersonic gas flow. PMTF no.4:43-48 N-D '60. (MIRA 14:7)
(Skin friction (Aerodynamics))
(Gas dynamics)

80279
S/170/60/003/02/20/026
B008/B005

10.2000
10.6000

AUTHOR: Leont'yev, A. I.

TITLE: One-dimensional Movement of Gases in a Cylindrical Channel With a Given Law of Heat Supply

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, 1960, Vol. 3, No. 2, pp. 97-100

TEXT: The solution of the problem of one-dimensional movement of gas in a tube is given for a general case of an arbitrary law of heat supply. Under consideration of the admissions accepted in Ref. 1, the equation of motion for the gas may be represented as follows:

$$\left(1 - \frac{1}{\lambda^2}\right)\frac{d\lambda}{\lambda} + \left[\frac{1 + \lambda^2}{2\lambda^2} f + \frac{2k}{k+1}\right] dz = 0, \quad (1) \quad f = \frac{\varphi}{\int_0^z \varphi\, dz + 1}; \quad \varphi = \frac{q(\bar{X})}{\alpha T_{01}};$$

$z = \frac{\xi \bar{X}}{2}$. For small values of λ, the equation is linearized, and the solution is obtained in squares. The differential equation obtained (1) permits the

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One-dimensional Movement of Gases in a Cylindrical Channel With a Given Law of Heat Supply

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B008/B005

determination of the law of heat supply necessary for a given distribution of the velocity coefficient along the length of the channel. It is shown that for each law of change of the velocity coefficient along the length of the channel, where $\frac{d\lambda}{dz} \neq \infty$, and $\lambda = 1$, there exist limiting values of the velocity coefficient above or below which movement of the gas is impossible. For velocities lower than the speed of sound $\lambda_{limit} < 1$ and for supersonic velocities $\lambda_{limit} > 1$. A. A. Gukhman (Ref. 4) is mentioned. There are 5 Soviet references.

ASSOCIATION: Institut teplofiziki Sibirskogo otdeleniya AN SSSR (Institute of Thermal Physics of the Siberian Branch of the AS USSR)

Card 2/2

LEONTYEV, A. I., and FEDOROV, V. I.

"Application of the Local Modelling Theory to the Investigation of Heat Transfer and Resistance at Gas Flow along the Ducts."

Report submitted for the Conference on Heat and Mass Transfer, Minsk, BSSR, June 1961.

LEONT'YEV, A. I., ABLIVIN, A. P., and ROMANENKO, P. N.

"Investigation of Heat Transfer and Resistance at Motion of a Heated Air in Diffusers and Confusors."

Report submitted for the Conference on Heat and Mass Transfer, Minsk, BSSR, June 1961.

31244
S/207/61/000/005/003/015
D237/D303

26.2136
26.2181

AUTHORS: Leont'yev, A.I., Oblivin, A.N., and Romanenko, P.N. (Moscow)

TITLE: Investigating resistance and heat exchange for super-sonic air flow in axially symmetrical ducts in the presence of a longitudinal pressure gradient

PERIODICAL: Zhurnal prikladnoy mekhaniki i tekhnicheskoy fiziki, no. 5, 1961, 16 - 25

TEXT: This is an account of experimental work on the characteristics of a turbulent boundary layer during the passage of heated air through diverging and converging ducts with cooled walls. Angles of divergence used were 8°4' and 12°, angle of convergence was 8°. The range of Reynolds numbers covered was R = 1.688 x 10^5 to R = 8.48 x 10^5. Temperature range of water cooled walls was 286°K - 320°K, while that of air was 425°K - 623°K. Flow velocity was up to M = 0.5. Ducts were sectioned and the following data were recorded: Air pressure before passing the heater and before the duct entran-

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31244

Investigating resistance and ... S/207/61/000/005/003/015
D237/D303

data and it was concluded that it does not agree with experiment in case of the turbulent boundary and hence τ/q ratio is not constant. Yu.P. Semenov, A.K. Voskresenskiy, V.N. Kharchenko, and L.G. Shelegova are mentioned for their help in the experiment. There are 10 figures and 17 references: 3 Soviet-bloc and 14 non-Soviet-bloc. The 4 most recent references to the English-language publications read as follows: F.H. Clauser, Turbulent boundary layer in adverse pressure gradients, J.A.S., 1954, v. 21, no. 2,91-108; G.C. Brebner, I.A. Bagley, Pressure and boundary layer measurements on a two-dimensional wing at low speed R. and M. 1952, no. 2886; G.B. Schubauer, P.S. Klebanoff, Investigation of separation of the turbulent boundary layer NACA Rep. 1030, 1950; D.A. Spence, The development of turbulent boundary layers. IAS, 1956, v. 23, 3 - 15.

SUBMITTED: May 27, 1961

Card 3/3

X

39603
S/196/62/000/014/026/046
E194/E155

AUTHORS: Romanenko, P.N., and Leont'yev, A.I.

TITLE: An experimental study of the turbulent boundary layer during motion of gas in axially-symmetrical diffusers with cooled walls

PERIODICAL: Referativnyy zhurnal, Elektrotekhnika i energetika, no.14, 1962, 4, abstract 14 G 19. (Tr. Mosk. in-ta inzh. zh.-d. transp., no.139, 1961, 134-158).

TEXT: Experimental investigations are necessary because of the difficulty of applying statistical theory to the study of anisotropy of turbulence. Results are given of an investigation of a turbulent boundary layer during flow of hot air in diffusers of circular section with cone angles of 8° 4' and 12°. By using an axially-symmetrical diffuser it is possible to exclude the influence on the calculation of local resistance factors and other characteristics of three-dimensional gas flow. The data are generalised and as a result, recommendations are made for calculating the dynamic boundary layer and the thermal boundary

Card 1/2

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23748

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S/170/61/004/006/002/015
B129/B212

AUTHORS: Kutateladze, S. S., Leont'yev, A. I.

TITLE: Resistance and heat transfer in a turbulent boundary layer of a compressed gas and the calculation of friction and heat transfer

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, v. 4, no. 6, 1961, 33-41

TEXT: A method based on the laws of friction and heat transfer is brought to calculate the friction and the heat transfer in a turbulent boundary layer of a compressed gas. The theoretical law is found for the resistance and the heat transfer for the turbulent boundary layer of such a gas and the relative effects of heat transfer and compressibility on friction and heat transfer are calculated. This makes it possible to simplify methods of solving integral relations of the boundary layer of the compressed gas for the forming of streamlines with longitudinal velocity gradient and temperature gradient in regions, which are at a certain distance from the separation point. In a detailed investigation the formula

Card 1/4

23748

$$\left(\frac{c_f}{c_{f_0}}\right)_{\mathrm{Re}^{**}} = \frac{r}{(\psi^* - 1)(1 - 11{,}6\sqrt{c_{f_0}/2})} \times$$
$$\times \left[\arcsin \frac{2(\psi^* - 1) + r\varepsilon\Delta\psi}{\sqrt{4r(\psi^* - 1)(\psi^* + \Delta\psi) + (r\varepsilon\Delta\psi)^2}} - \right.$$
$$\left. - \arcsin \frac{2(\psi^* - 1)\,11{,}6\sqrt{c_{f_0}/2} + r\varepsilon\Delta\psi}{\sqrt{4r(\psi^* - 1)(\psi^* + \Delta\psi) + (r\varepsilon\Delta\psi)^2}}\right]^2. \qquad (20)$$

is derived for the friction of a turbulent boundary layer of a compressed gas. Fig. 3 brings a comparison of the data obtained with (20) and experimental results, which are taken from an earlier paper of the authors (PMTF, no. 4, 1960). The data agree well for M = 10 and T_{equ} = 0.16. It is shown that even in the first approximation the theoretical formula is satisfactory for calculating the effect of the Reynolds number on the relative change of the friction coefficient with the temperature factor. All experimental data agree with the theoretical calculation within the limits of measuring accuracy. Using the law of conservation for the turbulence constant it can be extended to the transition from the laminar boundary layer to the developed turbulent one. Here, it should be borne in mind that in general a great accuracy of the calculation formulas will not be required in the transition zone, so far as its characteristics are not stable by their nature. There are 4 figures and 14 references: 7 Soviet-bloc and 7 non-Soviet-bloc. The most important references to English-language publications read as follows: Eckert E., Trans. ASME 78, 1273, 1956; Van Driest, F. Aeron. Sci., 19, 55, 1952.

ASSOCIATION: Institut teplofiziki Sibirskogo otdeleniya AN SSSR, Moskva (Institute of Heat Physics of the Siberian Department of AS USSR, Moscow)

PRESENTED: March 18, 1961

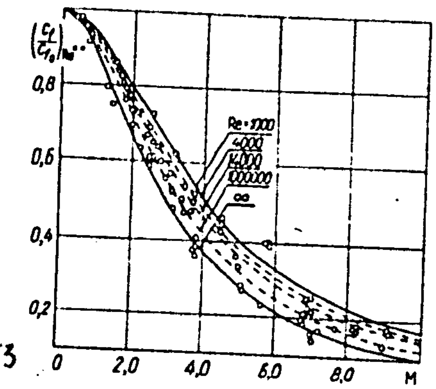

Fig.3

25121

11.7430

S/170/61/004/006/013/015
B129/B212

AUTHORS: Leont'yev, A. I., Fedorov, V. K.

TITLE: Calculation of the one-dimensional flow of a gas in a cylindrical channel for a given law of the heat supply

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, v. 4, no. 6, 1961, 125-127

TEXT: A solution is given for the problem of the one-dimensional flow of a compressed gas in a cylindrical channel for the case where the coefficient of the hydraulic resistance is constant along the pipe. If strong heat flows and great velocities of the gas flow occur it is necessary to take into account the effect of the temperature factor and the number M on the coefficient of resistance. The authors compare graphically their calculation results with those of other researchers. It is shown that consideration of the compression effect on the coefficient of friction at supersonic velocities of the gas flow will essentially affect the law describing the change of λ ($\lambda = w/a^*$ - velocity of the gas flow; viz. critical velocity) along the pipe. The divergence

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of λ will increase if M increases at the entrance. The maximum pipe lengths at supersonic speeds of the gas at the entrance of the pipe are comparatively short, and the problem of the expansion of the one-dimensional flow diagram needs further studies for these conditions.

$$\xi = \xi_0 \left(1 - \frac{k-1}{k+1}\lambda^2\right)^{0.6} \sqrt{\frac{T_{ст}}{T_0}}. \quad (1)$$

From the results shown in Fig. 2 it is apparent that the effect of the compressibility on the coefficient of friction is given by the change of the critical pipe length for supersonic speeds. Fig. 2 shows the critical length of the pipe as a function of the reduced velocity at the entrance. The dotted curve is taken from S. A. Khristianovich (Prikladnaya gazovaya dinamika (Applied Gas Dynamics), 1948). S. S. Kutateladze and F. S. Voronin are mentioned. There are 3 figures and 4 Soviet-bloc references.

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S/170/61/004/006/013/015
B129/B212

Calculation of the one-dimensional...

ASSOCIATION: Energeticheskiy institut im. G. M. Krzhizhanovskogo, g. Moskva (Institute of Power Engineering imeni G. M. Krzhizhanovskiy, Moscow)

SUBMITTED: September 22, 1960

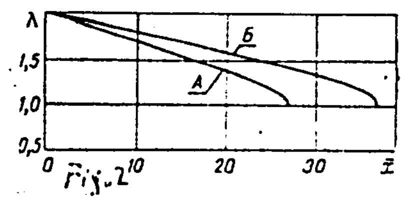

Fig. 2: λ as function of the pipe length calculated by the author (Б) and by Khristianovich (A).

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Calculation of the one-dimensional...

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S/170/61/004/006/013/015
B129/B212

Fig. 3: Critical length λ of the pipe as function of the reduced velocity at the entrance.

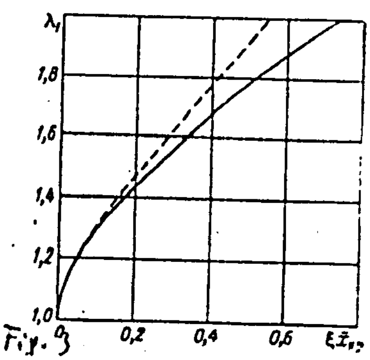

Fig. 3

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25556
S/170/61/004/008/006/016
B116/B201

AUTHORS: Leont'yev, A. I., Fedorov, V. K.

TITLE: Effect of inlet conditions upon the law of heat exchange in the initial section of a cylindrical tube

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, v. 4, no. 8, 1961, 63 - 68

TEXT: The results of an analysis of experimental data of VTI, MEI, and ENIN concerning convective heat transfer in the initial section of a cylindrical tube are presented. The analysis was made on the basis of local simulation. The heat-exchange laws for various conditions at the tube inlet were established. Methods of calculating the convective heat exchange in the initial section of the cylindrical tube are presented for the case T_{CT} = const and q_{CT} = const. The fundamental ideas of the theory of local simulation have been presented in papers by V. M. Ievlev (Refs. 1 and 2: DAN SSSR, t. 36, no. 6, 1952 and DAN SSSR, t. 37, no. 1, 1952). The equation of the thermal boundary layer for the initial section of a cylindrical tube reads:

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Effect of inlet conditions ...

$$\frac{d\mathrm{Re}_\theta}{d\mathrm{Re}_x} + \mathrm{Re}_\theta \frac{1}{\bar{t}_0} \frac{d\bar{t}_0}{d\mathrm{Re}_x} = a_m, \qquad (1)$$

$$\mathrm{Re}_\theta = \frac{\bar{u}}{\mu_0} \int_0^\Delta \frac{\rho u}{\bar{u}} \left(1 - \frac{t_0}{\bar{t}_0}\right)\left(1 - \frac{y}{r}\right) dy;$$

where

$$\bar{t}_0 = \bar{T}_0 - T_{\text{ст}}; \qquad t_0 = T_0 - T_{\text{ст}}; \qquad (2)$$

$$d\mathrm{Re}_x = \frac{\bar{\rho}\bar{u}\,dx}{\bar{\mu}}; \qquad a_m = \frac{q_{\text{ст}}}{g\bar{\rho}\bar{u}c_p\bar{t}_0};$$

$\bar{T}_0$ and T_0 denote the temperature found when decelerating the gas in the flow center and in the boundary layer, respectively. $\bar{\rho}$ and $\bar{\mu}$ are, respectively, the density and viscosity with respect to the thermodynamic

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temperature in the flow center. $\bar{u}$ is the velocity in the undisturbed flow. r and x denote the tube radius and the distance from the tube axis, respectively. For solving (1), it is necessary to determine the relationship between α_m and Re_θ. If, during the experiments, the distribution of the specific heat flows, of the wall temperature, and of the static pressures along the tube are measured, the local values of Re_θ and α_m can be determined on the strength of these measurements and from the following formulas:

$$Re_\theta = \frac{\int_0^x q_{cT} dx}{\mu c_p g \bar{t}_0}, \quad (3)$$

$$\alpha_m = \frac{q_{cT} D}{Re_D c_p g \mu \bar{t}_0}, \quad (4)$$

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Effect of inlet conditions ...

$$Re_D = \beta(1-\beta^2)^{\frac{1}{k-1}} Re_{D_0};\qquad (5)$$

$$\beta = \frac{\bar{u}}{w_{max}};\quad w_{max} = \sqrt{2c_pT_0};\quad Re_{D_0} = \frac{\rho_0 w_{max} D}{\mu_0};$$

where μ_0 is the dynamic viscosity with respect to the impact temperature. The value of the dimensionless velocity β is determined on the basis of the distribution of static pressures and from the relation

$$p/p_0 = (1-\beta^2)^{k/(k+1)} \qquad (6)$$

As may be seen from Fig. 1, conditions at the tube inlet have a considerable effect upon the heat exchange in the initial tube section. The equation for the thermal boundary layer, the equation of continuity, and the law of heat exchange are used to derive the calculation formulas. For the case T_{CT} = const, one obtains the formula

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Effect of inlet conditions ... S/170/61/004/008/006/016
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$$x = \frac{T_{\text{ст}}^{0,5}}{0,0102}\left[\frac{4\,\mathrm{Re}_{\text{ф}}^{0,25}}{5,2\,T_{\text{ст}}\mathrm{Pr}^{0,6}} - \frac{\mathrm{Re}_{D_1}^{0,25}}{(5,2\,T_{\text{ст}}\mathrm{Pr}^{0,6})^{1/4}\sqrt{2}} \times\right.$$

$$\times\left\{\ln\frac{\mathrm{Re}_{\text{ф}}^{0,5} + \left(\frac{\mathrm{Re}_{D_1}\mathrm{Re}_{\theta}}{5,2\,T_{\text{ст}}\mathrm{Pr}^{0,6}}\right)^{0,25}\sqrt{2} + \sqrt{\frac{\mathrm{Re}_{D_1}}{5,2\,T_{\text{ст}}\mathrm{Pr}^{0,6}}}}{\mathrm{Re}_{\text{ф}}^{0,5} - \left(\frac{\mathrm{Re}_{D_1}\mathrm{Re}_{\theta}}{5,2\,T_{\text{ст}}\mathrm{Pr}^{0,6}}\right)^{0,25}\sqrt{2} + \sqrt{\frac{\mathrm{Re}_{D_1}}{5,2\,T_{\text{ст}}\mathrm{Pr}^{0,6}}}} + \right. \tag{14}$$

$$\left.\left. + 2\,\mathrm{arctg}\frac{\left(\frac{\mathrm{Re}_{D_1}\mathrm{Re}_{\theta}}{5,2\,T_{\text{ст}}\mathrm{Pr}^{0,6}}\right)^{0,25}\sqrt{2}}{\sqrt{\frac{\mathrm{Re}_{D_1}}{5,2\,T_{\text{ст}}\mathrm{Pr}^{0,6}}} - \mathrm{Re}_{\text{ф}}^{0,5}}\right\}\right].$$

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and for the case q_{CT} = const the formula

$$\bar{x} = \frac{1}{2 \cdot 5{,}2\,\frac{Nu_1}{Pr^{0,4}}\,A}\left[-(5{,}2\,Pr^{0,6} A Re_\theta + A\,Re_{D_1} - 0{,}5\,\frac{Nu_1}{Pr}\,Re_\theta^m) + \sqrt{\left[5{,}2\,Pr^{0,6} A\,Re_\theta + A\,Re_{D_1} - 0{,}5\,\frac{Nu_1}{Pr}\,Re_\theta^m\right]^2 + 20{,}8\,\frac{Nu_1}{Pr^{0,4}}\,A Re_H^{m+1}}\,\right]. \quad (18)$$

For case II, Fig. 1, A = 0.214, m = 0.53; for case III, Fig. 1, A = 0.0331, m = 0.32. When deriving these equations, the effect of the temperature factor upon the heat exchange was taken into account by means of a formula (not given here) by S. S. Kutateladze (Ref. 6: Osnovy teorii teploobmena. Mashgiz, 1957). The method presented here may also be applied to the case of any law concerning heat supply along the tube. Although, as may be seen from Figs. 2 and 3, calculated values agree sufficiently with experimental data, the problem of the effect of inlet conditions upon convective heat exchange does not seem to be definitely

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Effect of inlet conditions ...

solved, considering that only three different cases were examined. There are 3 figures and 6 Soviet-bloc references.

ASSOCIATION: Energeticheskiy institut im. G. M. Krzhizhanovskogo, g. Moskva (Institute of Power Engineering imeni G. M. Krzhizhanovskiy, Moscow)

SUBMITTED: October 21, 1960

Fig. 1: Heat-exchange laws established on the basis of experimental data. Legend: (I) V. V. Kirillov (Ref. 4: Kandidatskaya dissertatsiya. MEI, 1958) (MEI); (II) V. L. Lel'chuk and B. V. Dedyakin (Ref. 3: Voprosy teploobmena. Izd. AN SSSR, 1959); (III) ENIN (Ref. 5: Kalikhman L. Ye. Turbulentnyy pogranichnyy sloy na krivolineynoy poverkhnosti, obtekayemoy gazom. Oborongiz, 1956); (IV) data concerning a plate ($\alpha_m = 0.0128\ Re_0^{-0.25}\ \overline{T}_{CT}^{-0.5}$). Conditions during experiments at the inlet are shown in the upper part.

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AM4007934 BOOK EXPLOITATION S/

Kutateladze, Samson Semenovich; Leont'yev Aleksandr Ivanovich

The turbulent boundary layer of compressible gas (Turbulentny*y pogranichny*y sloy szhimayemogo gaza) Novosibirsk, Izd-vo Sib. otd. AN SSSR, 1962. 179 p. illus., biblio. Errata slip inserted. 1500 copies printed. Sponsoring agency: Akademiya nauk SSSR. Sibirskoye otdeleniye.

TOPIC TAGS: turbulent boundary layer, compressible gas flow, boundary layer theory

PURPOSE AND COVERAGE: This book is intended for scientific workers, aerodynamic engineers, thermophysicists, and students of advanced courses in these specialties. It may also be used as a handbook for practical calculations in design bureaus. The book presents a turbulent-boundary-layer theory of a compressible gas. The theory is based on the investigation of relative variations of coefficients of friction and heat transfer with increase in Mach number, the heat transfer factor, and the wall permeability factor. The existence of the limiting law corresponding to rather high Re numbers and nearly total self-modeling of relative varia-

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tions of friction and heat transfer coefficients is demonstrated. Simple engineering methods are proposed for the solution of heat-transfer problems in turbulent flow over solid bodies. Theoretical and experimental data are compared. The Prandtl-Karman and Taylor semiempirical theory of near-wall turbulence was used to explain the existence of the logarithmic velocity profile in isothermal fluid flow at weak pressure gradients over impermeable surfaces.

TABLE OF CONTENTS [Abridged]:

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KUTATELADZE, Samson Semenovich. Prinimali uchastiye: LEONT'YEV, A.I.; BORISHANSKIY, V.M.; ZYSINA, L.M., doktor tekhn. nauk, retsenzent; GORDOV, A.N., kand. fiz.-mat. nauk, red.; ONISHCHENKO, R.N., red. izd-va; MITARCHUK, G.A., red. izd-va; SHCHETININA, L.V., tekhn. red.

[Fundamentals of the heat transfer theory] Osnovy teorii teploobmena. Izd.2., dop. i perer. Moskva, Mashgiz, 1962. 455 p. (MIRA 15:7)

(Heat—Transmission)

S/207/62/000/001/008/018
B104/B108

21.5900
10.1300

AUTHORS: Kutateladze, S. S., Leont'yev, A. I. (Novosibirsk, Moscow)

TITLE: Turbulent boundary layer of a gas on a permeable wall

PERIODICAL: Zhurnal prikladnoy mekhaniki i tekhnicheskoy fiziki, no. 1, 1962, 51 - 60

TEXT: The authors show that limiting laws not dependent on the empirical turbulence constants exist for the relative effect of various factors in a turbulent boundary layer on the coefficient of friction. With the theory of limiting laws of a turbulent boundary layer a method is presented of calculating heat transfer and friction on a porous plate and on the surface of the front part of a body in the turbulent boundary layer. The law

$$\left(\frac{c_f}{c_{f_0}}\right)_{R_x} = (1-0.25b)^2(1+0.25b)^{-0.4} \qquad (14)$$

is obtained where c_f denotes the local coefficient of friction, c_{f0} the

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local coefficient of friction for isothermal stationary flow, b a factor characterizing permeability. This law agrees well with the experimental results of several authors (D. S. Hacker, Jet Propulsion, 1956, v. 26, no. 9; H. S. Mickley and R. S. Davis, Momentum Transfer for Flow over a Flat Plate with Blowing, NACA TN 4017, November 1957; C. C. Pappas, A. F. Okuno, J. of the Aero Space Sci., 1960, v. 27, no. 5, pp. 321 - 323). Experimental data of H. S. Mickley (see above) and J. A. Friedman (J. Am. Roc. Soc., 1949, no. 79, pp. 147 - 154) on the influence of gas blowing on the convective heat transfer are compared to the limiting law of heat transfer

$$\Psi_T = \left(1 - \frac{b_T}{b_{T_*}}\right)^2; \qquad b_{T_*} = b_* = 4.0 \tag{16}$$

in Fig. 5. b_T is the parameter of thermal permeability, b_* the critical permeability corresponding to separation of the boundary layer from the wall. A similar formula for the effect of gas blowing on the coefficient of friction also agrees well with experimental data. V. P. Motulevich

37561

S/096/62/000/005/008/009
E194/E454

26.5200

AUTHORS: Kosterin, S.I., Doctor of Technical Sciences, Professor,
Leont'yev, A.I., Candidate of Technical Sciences,
Fedorov, V.K., Engineer

TITLE: Methods of generalizing experimental data on convective heat transfer during motion of gas in the initial section of a tube

PERIODICAL: Teploenergetika, no.5, 1962, 70-72

TEXT: A review of existing methods of generalizing experimental data on heat transfer by convection with a turbulent boundary layer which are based on criterial equations shows that none of them is reliable or scientifically well-founded. It is accordingly recommended to use the theory of local modelling, according to which the object of the experiment is to establish the laws of heat transfer and resistance in the turbulent boundary layer; the influence of various external factors such as pressure distribution and wall temperature being allowed for in the boundary layer equations. Equations of the thermal boundary layer for the motion of gas in the initial section of a tube are

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then written down. To obtain local experimental values of Stanton's criterion it is necessary to determine the gas parameters in the body of the flow, which may be done either from measurements of static pressure distribution over the length of the tube or from thermal measurements alone. The derivation of the following expression for the Stanton and Pekle criteria is explained

$$Pe_{\theta} = \frac{\int_{0}^{x} q_{ct}\, dx}{t_{o} \lambda_{oo}} \qquad (2)$$

$$St = \frac{q_{ct} D}{(Re_{D_1} + 4h\, Re_{\vartheta})\, Pr \lambda_{oo} t_{o}} \qquad (6)$$

where q_{ct} - heat flow at the tube wall;
$t_o \approx T^{*}_{ct} - T_{ct}$ = equilibrium wall temperature - wall temperature;

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mainly governs the distribution of heat transfer coefficients over the length of the tube) on the laws of heat transfer and the influences of temperature variations and compressibility can be expressed directly. The proposed law of heat transfer is of universal nature and the direct influence of $\bar{x}$ and of the law of application of heat in the distribution of local heat transfer coefficients is allowed for by the equation of the thermal boundary layer. There is 1 figure.

ASSOCIATIONS: Institut mekhaniki AN SSSR (Institute of Mechanics AS USSR)
Institut teplofiziki SO AN SSSR (Institute of Thermal Physics SO AS USSR)

31876
S/170/62/C05/001/004/013
B104/B102

10.1300

AUTHORS: Kutateladze, S. S., Leont'yev, A. I.

TITLE: Calculation of a turbulent boundary layer at strong positive pressure gradients

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, v. 5, no. 1, 1962. 33-41

TEXT: A turbulent boundary layer is calculated on the basis of limiting laws of friction and heat exchange in the diffusion zone of a gas flow. The theory of these laws, developed in previous papers by the authors (PMTF, no. 4, 1960; IFZh, no. 6, 1961), makes it possible to analyze the effect of the pressure gradient on the turbulent boundary layer. The critical parameters at the point of separation of the turbulent boundary layer are determined, and the effect of heat exchange and compressibility of the gas on these parameters is assessed. It is shown that the heat exchange is only slightly dependent on the pressure gradient in the range of variation of Re^{**}. Based on integral expressions for momentum and energy, heat exchange and friction are calculated with the help of the limiting laws mentioned. Mention is made of L. G. Loytsyanskiy

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42080

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B104/B102

10 2000

AUTHORS: Romanenko, P. N., Leont'yev, A. I.

TITLE: Resistance in the diffuser range of a flow in the formation of a turbulent boundary layer at the wall

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, v. 5, no. 11, 1962, 87-89

TEXT: Various methods of determining the local friction coefficient in a gradient flow of a gas, already treated in numerous publications, are here reviewed. In a previous paper (PMTF, no. 5, 1961) P. N. Romanenko, A. I. Leont'yev and A. N. Oblivin extended the method devised by F. H. Clauser (IAS, 21, 2, 1954) for isothermal gas flows to non-isothermal gas flows. The authors consider that the extended method gives the best results.. In the previous paper it was shown that, for determining the friction coefficient by Clauser's method, the method of A. Buri (Eine Berechnungsgrundlage für die turbulente Grenzschichte bei beschleunigter und verzögerter Strömung - A calculation base for the turbulent boundary layer of accelerated and decelerated flow. - Dissertation. Zürich, 1931) gives reliable results which can be extended to a turbulent boundary layer with
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NOVIKOV, I.I.; KUTATELADZE, S.S., prof.; LEONT'YEV, A.I.; MUSLIN, Ye.

Science of fire and cold. Nauka i zhizn' 29 no.1:58-59 Ja '62. (MIRA 15:3)

1. Direktor Instituta teplofiziki Sibirskogo otdeleniya AN SSSR; chlen-korrespondent AN SSSR (for Novikov). 2. Zaveduyushchiy laboratoriyey termogazodinamiki Instituta teplofiziki Sibirskogo otdeleniya AN SSSR (for Leont'yev).

(Thermodynamics)

KUTATELADZE, S.S.; LEONT'YEV, A.I.

Thermal screen in a turbulent boundary layer of gas. Teplofiz. vys. temp. 1 no.2:281-290 S-O'63. (MIRA 17:5)

1. Institut teplofiziki Sibirskogo otdeleniya AN SSSR.

ACCESSION NR: AP4017726 S/0294/63/001/003/0458/0460

AUTHORS: Kutateladze, S. S.; Leont'yev, A. I.

TITLE: Effect of gas dissociation on friction and heat exchange in a turbulent boundary layer

SOURCE: Teplofizika vy*sokikh temperatur, v. 1, no. 3, 1963, 458-460

TOPIC TAGS: boundary layer, turbulent boundary layer, laminar boundary layer, gas friction, gas dissociation, heat exchange, hypersonic flow, limit law theory

ABSTRACT: Gas dissociation in a turbulent layer, which unlike that in a laminar layer has not been thoroughly investigated, is considered for hypersonic velocities (M > 10) and the law of friction and heat exchange is derived on the basis of the limit laws established by the authors elsewhere (Turbulentny*y pogranichny*y sloy szhimayemogo

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ACCESSION NR: AP4017726

gaza, Sib. otd. AN SSSR, 1962). The final friction equation is, allowing for compressibility and heat exchange,

$$\left(\frac{c_f}{c_{f_0}}\right)_{Re^{**}} = \frac{1}{\psi^*-1}\left[\arcsin\frac{2(\psi^*-1)+\Delta\psi}{\sqrt{4(\psi^*-1)(\psi^*+\Delta\psi)+(\Delta\psi)^2}} - \arcsin\frac{\Delta\psi}{\sqrt{4(\psi^*-1)(\psi^*+\Delta\psi)+(\Delta\psi)^2}}\right]^2\left(\frac{2}{\sqrt{\bar{\alpha}}+1}\right)^2,$$

where c_f -- friction coefficient under the conditions in question, c_{f0} -- friction coefficient for flow of an incompressible liquid around a flat plate, Re** -- critical Reynolds number, ψ^* -- kinetic factor, $\Delta\psi = \psi - \psi^*$ -- heat exchange factor, α -- degree of dissociation. Comparison of a simplified version of this formula (for Reynolds numbers from 10^5 to 10^7) with computer results given by W. Dorrance (ARS Journal, v. 31, no. 1, 1961) showed both qualita-

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ACCESSION NR: AP4017726

tive and quantitative agreement. The maximum relative influence of the gas dissociation on friction in the turbulent boundary layer does not exceed 25%. Orig. art. has: 1 figure and 10 formulas.

ASSOCIATION: Institut teplofiziki Sibirskogo otdeleniya AN SSSR (Institute of Thermophysics, Siberian Department AN SSSR)

SUBMITTED: 29May63 DATE ACQ: 23Mar64 ENCL: 00

SUB CODE: PH, AI NO REF SOV: 002 OTHER: 004

Card 3/3

L 17453-63 EPR/EPA(b)/EPF(c)/EWT(l)/EPF(n)-2/BDS/ES(v) AEDC/AFFTC/AFMDC/
ASD/IJP(C)/SSD Ps-4/Pd-4/Pr-4/Pu-4/Pe-4 WW
ACCESSION NR: AP3006128 S/0207/63/000/004/0088/0093

85

AUTHOR: Kutateladze, S. S. (Novosibirsk); Leont'yev, A. I. (Novosibirsk); Rubtsov, N. A. (Novosibirsk)

TITLE: Evaluation of the role of radiation in calculating the heat transfer in a turbulent boundary layer

21

SOURCE: Zhurnal prikladnoy mekhaniki i tekhnicheskoy fiziki, no. 4, 1963, 88-93

TOPIC TAGS: heat transfer, radiation, convection, boundary layer, turbulent boundary layer, radiative heat transfer, heat radiation, radiating gas

ABSTRACT: Heat transfer by radiation and convection in a turbulent boundary layer has been analyzed. Thermal radiation from a high-temperature gas affects the temperature field in the boundary layer and consequently the conditions of heat transfer by conduction and convection. With allowance for these factors, the analysis was based on relationships previously derived by the authors for heat transfer and friction in a turbulent boundary layer. A combined Stanton number (S) was used as a criterion for the overall convective-radiative heat

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ACCESSION NR: AP3006128

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transfer. The resulting equation was applied to calculate heat transfer from a high-temperature radiating gas to a flat plate. The results shown in Fig. 1 of the Enclosure demonstrate that the optical density (k) has a substantial effect on heat transfer, particularly at high N/S_0 ratios (N/S_0 characterizes the fraction of radiation in undisturbed flow; S_0 is the Stanton number for a nonradiating gas at constant physical parameters inside the boundary layer). The comparatively simple formula derived can be used for the approximate solution of radiative-convective heat-transfer problems. Orig. art. has: 2 figures and 18 formulas.

ASSOCIATION: none

SUBMITTED: 12Mar63 DATE ACQ: 11Sep63 ENCL: 01

SUB CODE: AS, PR NO REF SOV: 003 OTHER: 002

Card 2/3

KUTATELADZE, S.S.; LEONTYEV, A.I. (Novosibirsk)

"Limiting friction and heat transfer laws in turbulent boundary layer".

report presented at the 2nd All-Union Congress on Theoretical and Applied Mechanics, Moscow, 29 Jan - 5 Feb 64.

KUTATELADZE, S.S.; LEONT'YEV, A.I.; RUBTSOV, N.A.; GOL'DSHTIK, M.A.; VOLCHKOV, E.P.; DAVYDOVA, I.V.; DRUZHININ, S.A.; KIRILLOVA, N.N.; FALENKOV, I.G.; MOSKVICHEVA, V.N.; MIRONOV, B.P.; MUKHIN, V.A.; MUKHINA, N.V.; REBROV, A.K.; FEDOROV, V.K.; KHABAKHPASHEVA, Ye.M.; SHTOKOLOV, L.S.; SHPAKOVSKAYA, L.I., red.

[Heat and mass transfer and friction in a turbulent boundary layer] Teplomassoobmen i trenie v turbulentnom pogranichnom sloe. Novosibirsk, Red.-izd. otdel Sibirskogo otd-niia AN SSSR, 1964. 206 p. (MIRA 18:1)

L 43720-65 EWT(1)/EWP(e)/EWP(m)/EWT(m)/EPR/EWP(t)/EWP(k)/EWP(z)/FCS(k)/EWP(b)/ EWA(1) Pd-1/Pf-4/Pi-4 S/0207/64/000/006/0057/0062 45 B
ACCESSION NR: AP5008498 JD/WW

AUTHOR: Kutateladze, S. S. (Novosibirsk); Leont'yev, A. I. (Novosibirsk)

TITLE: A nonuniform turbulent boundary layer of gas on a permeable plate 18

SOURCE: Zhurnal prikladnoy mekhaniki i tekhnicheskoy fiziki, no. 6, 1964, 57-62

TOPIC TAGS: boundary layer, turbulent boundary layer, turbulent flow, friction, heat exchange, permeable plate, Reynolds number, gas injection

ABSTRACT: The article cursorily deals with the results of the application of the theory of the relative laws of friction and heat exchange to the flow of a binary, turbulent boundary layer on a permeable plate in the region of finite values of Reynolds number R. This study was undertaken because the problem of calculating the boundary layer on a surface of separation, or on an absorbing mass, which can be reduced to the problem of flow around a semipermeable surface, cannot be solved in sufficiently complete form by the semi-empirical theories of the turbulent boundary. Though the solution developed in this article for the region of finite values of Reynolds** number is somewhat more complicated, it is logically less faulty. The experimental points for the injection of the most diverse gases for

Card 1/2

L 43720-65
ACCESSION NR: AP5008498

values of μ_1 from 2 to 121, [μ_1 is unidentified in the text] are closely grouped along the curve plotted from the calculated values. Orig. art. has: 5 figures and 22 formulas.

ASSOCIATION: none

SUBMITTED: 17Feb64 ENCL: 00 SUB CODE: ME

NO REF SOV: 004 OTHER: 008

mL
Card 2/2

L 41774-65 EWT(l)/EPF(c)/EPF(n)-2/EWG(m)/EPR Pr-4/Ps-4/Pu-4 WW

ACCESSION NR: AP5005758 S/0170/65/008/001/0007/0010

39

AUTHOR: Kutateladze, S. S.; Leont'yev, A. I.; Kirdyashkin, A. G.

38

B

TITLE: Contribution to the theory of heat exchange 21 in nucleate boiling

SOURCE: Inzhenerno-fizicheskiy zhurnal, v. 8, no. 1, 1965, 7-10

TOPIC TAGS: nucleate boiling, heat exchange, Reynolds number, Prandtl number, Nusselt number, boundary layer

ABSTRACT: It is shown first that in the case of nucleate boiling, the ratio of the thickness of the boundary layer in the liquid to the average linear dimension of the quadratic cell per effective steam formation center is quite small, so that boundary-layer theory can be applied to the heat exchange processes occurring in nucleate boiling. It is also shown that the heat transfer to the liquid can be regarded as occurring in the vicinity of the frontal point. Using the boundary-layer theory and the laws of free turbulence, the authors derive the following relation for the ratio of the Nusselt to the Reynolds number

$$Nu_*/Re_* = c_1^2 + c_2 Re_*.$$

Card 1/2

L 41774-65
ACCESSION NR: AP5005758

and show by plotting this formula and the available experimental data, as well as by plotting the experimental data against the theoretical curve

$$Nu_* = c Pr^{1/3} Re_*^m,$$

that the extension of the boundary-layer theory to nucleate boiling is valid. They also conclude that the boundary-layer theory can serve as a basis for a more detailed theory of heat exchange during boiling. Orig. art. has: 3 figures and 9 formulas.

ASSOCIATION: Institut teplofiziki SO AN SSSR, Novosibirsk (Institute of Thermophysics, SO AN SSSR)

SUBMITTED: 29Apr64 ENCL: 00 SUB CODE: NP, ME

NR REF SOV: 004 OTHER: 003

am
Card 2/2

L 52160-65 EWP(m)/EWT(1)/FCS(k)/EWA(d)/EWA(1) Pd-1

ACCESSION NR: AP5013370 UR/0207/65/000/002/0050/0053

AUTHORS: Volchkov, E. P. (Novosibirsk); Kutateladze, S. S. (Novosibirsk); Leont'yev, A. I. (Novosibirsk) 26 B

TITLE: Interaction between a submerged turbulent jet and a solid wall

SOURCE: Zhurnal prikladnoy mekhaniki i tekhnicheskoy fiziki, no. 2, 1965, 50-53

TOPIC TAGS: Nusselt number, turbulent flow, turbulent jet, boundary layer, skin friction, Stanton number

ABSTRACT: The conservation law of wall turbulence relative to changes in boundary conditions was used to investigate the interaction between a submerged turbulent jet with a solid wall. The schematic of the flow is shown in Fig. 1 on the Enclosure. A momentum integral method is used to obtain the momentum conservation equation

$$\frac{dR^{**}}{dX}+\left[1+\frac{\delta^{*}}{\delta^{**}}-\frac{\delta_1}{\delta^{**}}\right]\frac{R^{**}}{W_0}\frac{dW_0}{dX}=\frac{C_{f}}{2}R_sW_0$$

where

$$R^{**}=\frac{w_0\delta^{**}}{\nu_0},\quad X=\frac{x}{s},\quad W_0=\frac{w_0}{w_s},\quad \frac{C_{f}}{2}=\frac{\tau_w}{\rho_0 w_0^2},\quad R_s=\frac{w_s s}{\nu_0},$$

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L 52160-65
ACCESSION NR: AP5013370

and the velocity profile is determined from the one-seventh power law. An expression is derived for the skin friction coefficient C_f and, after a correlation with experimental data it, is reduced to the form

$$\frac{C_{f1}}{2} = \frac{0.0314}{R_e^{0.2} X^{0.11}};$$

Using this expression in the definition of the Stanton number, two equations are obtained for the nondimensional heat transfer coefficient which, for the submerged wall jet, is given by

$$N_x = \frac{\alpha x}{\lambda} = 0.1197 \left(\frac{w_0 x}{\nu_0}\right)^{0.8} X^{-0.4} P^{0.4}$$

and for the wall jet with a weak wake by

$$\frac{(\rho w)_0}{(\rho w)_\infty} > 3, \qquad S_t = \frac{0.113}{R_e^{0.2} X^{0.44} P^{0.6}}.$$

This latter equation is shown to coincide with the results of M. Jakob, R. Rose, and M. Spielman (Heat Transfer From an Air ~~Jet~~ to a Plane Plate With Entrainment of Water Vapor From the Environment. Trans. ASME, 1950, vol. 72, No. 6) for Pr = 0.71. Orig. art. has: 23 equations and 4 figures.

ASSOCIATION: none

Card 2/4

L 52160-65
ACCESSION NR: AP5013370

SUBMITTED: 14Aug64 ENCL: 01 SUB CODE: ME

NO REF SOV: 005 OTHER: 006

Card 3/4

L 45628-65 EWT(1)/EWP(m) Pd-1

ACCESSION NR: AP5006474 S/0294/65/003/001/0115/0123

10 9 B

AUTHOR: Tarasova, N. V.; Leont'yev, A. I.

TITLE: Hydraulic resistance in the flow of a steam-water mixture in a heated vertical tube

SOURCE: Teplofizika vysokikh temperatur, v. 3, no. 1, 1965, 115-123

TOPIC TAGS: hydraulic resistance, water steam mixture, pressure drop, friction drop

ABSTRACT: In view of the lack of published data applicable in the range of thermal loads prevailing in nuclear reactors, a special experimental investigation was set up to determine the influence of heating on friction resistance of a steam-water mixture. The set-up was an open loop fed with supercritical steam (p = 294 bar, t = 650C). The steam-water mixture was produced in a vertical heated tube by throttling the supercritical steam, which was first cooled to a specific heat content. The experimental tube was 1200 mm long, 550 mm of which was heated electrically. Measurements were made of the pressure and temperature at the inlet to the

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L 45628-65

ACCESSION NR: AP5006474

tube, the pressure drop, the thermal load, and the variation of the tube-wall temperature along its length. The pressure was varied between 49 and 196 bar, the mass velocity betweein 500 and 2000 kg/m^2sec, and the thermal load between 110,000 and 1.700,000 W/m^2. The results are represented by various plots and in the form of an empirical formula permitting calculation of the friction pressure loss in the region of low steam content. Orig. art. has: 6 figures, 9 formulas, and 1 table.

ASSOCIATION: Vsesoyuznyy teplotekhnicheskiy nauchno-issledovatel'skiy institut im. F. E. Dzerzhinskogo (All-Union Heat Engineering Scientific Research Institute)

SUBMITTED: 10Apr64 ENCL: 00 SUB CODE: IE, ME

NR REF SOV: 009 OTHER: 001

bjo

Card 2/2

L 64313-65 EPF(n)-2/EWT(1)/EWO(m) WW

ACCESSION NR: AP5020209 UR/0170/65/009/001/0009/0014
536.25

AUTHOR: Leont'yev, A. I.; Kirdyashkin, A. G.

TITLE: Heat transfer in free convection in horizontal slots and in a large volume on a horizontal surface

SOURCE: Inzhenerno-fizicheskiy zhurnal, v. 9, no. 1, 1965, 9-14

TOPIC TAGS: heat transfer, thermal convection, fluid flow, boundary layer heat transfer, Rayleigh number

ABSTRACT: The theoretical development in the article is based on the following "experimental facts.": 1) Free flow of a fluid in horizontal slots in a Rayleigh number range of 1700-45,000 has a strongly exhibited "cellular" structure; 2) with an increase in the width of the slots to infinity (large volume) in the direct neighborhood of the surface, the heat transfer retains the "cellular" structure of fluid flow; 3) in the intermediate region, at Rayleigh numbers greater than 45,000 the cellular structure is retained at the lower heat transfer surface. The solution of the problem is carried out in two stages: 1) determination of the fluid flow

L 64313-65

ACCESSION NR: AP5020209

3

rate in the cells; 2) calculation of the thermal boundary layer with forced flow of the fluid past the heat transfer surface. This theoretical solution is compared to existing experimental data with good results. Orig. art. has: 29 formulas and 3 figures

ASSOCIATION: Institut teplofiziki SO AN SSSR, g. Novosibirsk (Thermophysics Institute of the Siberian Branch, AN SSSR) 44,55

SUBMITTED: 16Nov64 ENCL: 00 SUB CODE: TD

NR REF SOV: 002 OTHER: 014

Card 2/2

L 51475-65 EWP(m)/EPF(c)/EPF(n)-2/EPR/EWT(1)/FCS(k)/EWG(m)/EWA(1) Pd-1/Pr-4/Ps-4/Pu-4/Pi-4 WW

AM5012942 BOOK EXPLOITATION S/ 71

Kutateladze, S. S., ed.

Heat and mass transfer and friction in a turbulent boundary layer (Teplomassoobmen i treniye v turbulentnom pogranichnom sloye) Novosibirsk, Redizdat Sib. otd. AN SSSR, 1964. 206 p. illus., biblio. Errata slip inserted. 1000 copies printed. (At head of title: Akademiya nauk SSSR. Sibirskoye otdeleniye. Institut teplofiziki) Editor: L. I. Shpakovskaya; Technical editor: Ye. G. Shmakova; Proofreader: L. I. Korshunova

TOPIC TAGS: boundary layer flow, detached flow, friction, heat transfer, incompressible fluid, mass transfer, nonisothermal flow, radiation effect, turbulent boundary layer

PURPOSE AND COVERAGE: This book is a continuation of the monograph by S. S. Kutateladze and A. I. Leont'yev, published in 1962, in which certain properties of the limiting laws of friction and heat transfer in the turbulent boundary layer on a solid were formulated and specific applications of these laws were analysed. The basic portion of the book was written by Kutateladze and A. I. Leont'yev.

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16

N. A. Rubtsov was mainly responsible for the development of problems of the interaction of the turbulent boundary layer with radiation. The theory of the flow structure beyond the region of detachment was developed by M. A. Gol'dshtik. Others who helped prepare the book were M. N. Kirillova, B. P. Mironov, V. A. Mukhin, N. V. Mukhina, A. K. Rebrov, V. K. Fedorov, M. V. Davydova, S. A. Drushinin, E. P. Volchkov, Ye. M. Khabakhpasheva, I. O. Malenkov, V. N. Moskvicheva, and L. S. Shtokolov. Professor D. B. Spolding helped in the analysis of certain interesting questions.

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Card 2/3

L 51475-65

AM5012942

SUB CODE: ME SUBMITTED: 30ct64 NR REF SOV: 049

OTHER: 070 DATE ACQ:

Card 3/3

L 5395-66 EWT(1)/EWP(m)/EWT(m)/EPF(c)/ETC/EPF(n)-2/EWG(m)/EWA(d)/T/FCS(k)/EWA(1)
WW/DJ

ACC NR: AP5027289 SOURCE CODE: UR/0207/65/000/005/0162/0166

AUTHORS: Leont'yev, A. I. (Novosibirsk); Mironov, B. P. (Novosibirsk)

ORG: none

TITLE: Extension of limiting relative friction and heat transfer laws to nonisothermal gas flows with finite Reynolds numbers

SOURCE: Zhurnal prikladnoy mekhaniki i tekhnicheskoy fiziki, no. 5, 1965, 162-166

TOPIC TAGS: heat transfer, skin friction, Reynolds number, gas flow, turbulent boundary layer

ABSTRACT: The skin friction and heat transfer data in the literature are reviewed in detail to show that limiting friction and heat transfer laws, calculated theoretically, are also applicable to nonisothermal flows with finite Reynolds numbers. This is shown to be possible if local skin friction coefficients C_{f_0} and local Stanton numbers S_0 are defined. For example, an excellent data correlation is obtained with the expression $C_{f_0} = 0.0252 (R^{**})^{-0.25}$

Card 1/2

L 5395-66
ACC NR: AP5027289

where the Reynolds number is defined by the local parameters

$$R^{**} = \frac{w_e \rho_e \delta^{**}}{\mu_w}.$$

A similar agreement with experimental data is obtained with the limiting equations

$$\Psi_w = \left(\frac{2}{\psi^{0.5}+1}\right)^2$$

where

$$\Psi = \frac{C_f}{C_{f_0}}$$

$$\psi = \frac{T_w}{T_w^*}.$$

Thus, the introduction of C_{f_0} in the ratio Ψ allows one to calculate noniso-thermal turbulent boundary layers from the limiting expressions for Ψ without including the effects of finite Reynolds numbers. The same procedure can be followed for the heat transfer laws. A brief explanation is given to show that this behavior is intuitively obvious. Orig. art. has: 8 formulas and 2 figures.

SUB CODE: ME/ SUBM DATE: 20Sep64/ ORIG REF: 007/ OTH REF: 022

Card 2/2

L 24246-66 EWT(1)/EWP(e)/EWP(m)/EWT(m)/EWP(t)/EWP(k)/EWA(1) IJP(c) JD/WW/GS

ACC NR: AT6006920 SOURCE CODE: UR/0000/65/000/000/0351/0360

60

B+1

AUTHOR: Kutateladze, S. S.; Leont'yev, A. I.

ORG: Institute of Thermophysics, Siberian Branch, AN SSSR, Novosibirsk (Institut teplofiziki, Sibirskoye otdeleniye AN SSSR)

18

TITLE: The turbulent boundary layer of a gas on a porous surface

SOURCE: Teplo- i massoperenos. t. II: Teplo- i massoperenos pri vzaimodeystvii tel s potokami zhidkostey i gazov (Heat and mass transfer. v. 2.: Heat and mass transfer in the interaction of bodies with liquid and gas flows). Minsk, Nauka i tekhnika, 1965, 351-360

TOPIC TAGS: turbulent boundary layer, gas dynamics, Mach number, surface property

ABSTRACT: If the effect of thermo-, baro-, and dino-diffusion are neglected, then the system of differential equations for a binary boundary layer assumes the form:

Card 1/2

L 27160-66 EWT(1)/EWP(m)/EWA(1) WW
ACC NR: AP6012672

SOURCE CODE: UR/0170/66/010/004/0447/0451

AUTHOR: Leont'yev, A. I.; Mironov, B. P.; Lugovskoy, P. P.

ORG: Institute of Thermophysics of the SO, AN SSSR, Novosibirsk (Institut teplofiziki SO AN SSSR)

42
B

TITLE: Experimental determination of the critical blowing parameter on a porous plate

SOURCE: Inzhenerno-fizicheskiy zhurnal, v. 10, no. 4, 1966, 447-451

TOPIC TAGS: turbulent boundary layer, blowing parameter, porous plate

ABSTRACT: Experimental data on the determination of the critical blowing parameter on a porous plate are given. The method is based on the chemical reaction of the main stream with the fluid injected. The main stream is an acid solution and the injected fluid is an alkali solution colored by phenolphthalein. With injection flow rates below critical, a neutralization reaction takes place which results in decoloration of phenolphthalein. At critical injection flow rates, the main stream is displaced, and a clearly distinguishable film of the injected liquid appears on the plate surface. The experimental values of the critical injection parameter are in good agreement with the predicted ones obtained by the asymptotic theory of the turbulent boundary layer. Orig. art. has: 3 figures, 3 formulas, and 1 table. [NT]

SUB CODE: 20/ SUBM DATE: 08Aug65/ ORIG REF: 002/ OTH REF: 004/
Card 1/1 BK
UDC: 532.526

2

L 29818-66 EWT(d)/EWT(1) IJP(c) WW/JAJ

ACC NR: AP6012676 SOURCE CODE: UR/0170/66/010/004/0479/0481

AUTHOR: Druzhinin, S. A.; Leont'yev, A. I.

67

ORG: Thermophysics Institute of the Siberian Branch of the AN SSSR, Novosibirsk (Institut teplofiziki SO AN SSSR)

B

TITLE: Calculation of the temperature distribution on a porous plate

SOURCE: Inzhenerno-fizicheskiy zhurnal, v. 10, no. 4, 1966, 479-481

TOPIC TAGS: thermodynamic analysis, heat transfer temperature

ABSTRACT: It has been previously shown that to maintain the condition T_{wall} = const along the length of a porous plate, the flow rate of the injected gas must vary proportionally to $\bar{X}^{-0.2}$. In the case of uniform blowing, a case often occuring in practice, the wall temperature along the length will vary. Calculation of the distribution of $T_{wall} = f(\bar{X})$ can be carried out using the energy equation, the heat transfer law, and corresponding limits for a porous surface. Under these conditions, the energy equation, taking into account the velocity gradient, will be:

$$\frac{d\mathrm{Re}_T^{**}}{d\bar{X}} + \frac{\mathrm{Re}_T^{**}}{\Delta T}\frac{d(\Delta T)}{d\bar{X}} = \mathrm{Re}_0 \bar{U} \mathrm{St}_0 (\Psi_0 + b_T), \qquad (1)$$

Card 1/2

UDC: 536.21

L 29818-66

ACC NR: AP6012676

where

$$\Psi_s = Kb_T, \quad (2)$$

$$K = (T_{ct} - T')/(T_s - T_{ct}), \quad (3)$$

$$b_T = \bar{j}_{ct}/\bar{U}\,St_s. \quad (4)$$

Calculated results are shown in a series of curves. One figure illustrates the dependence of F_1 on Ψ for calculation of the temperature of a porous wall. This curve is claimed to simplify the calculation. A second figure shows calculated and experimental data for a plate with $\bar{U}$ = 1, for a middle cross section $\bar{X}$ = 0.5 and extreme values of the Reynolds number. Orig. art. has: 11 formulas and 2 figures.

SUB CODE: 20/ SUBM DATE: 08Aug65/ ORIG REF: 003/ OTH REF: 004

Card 2/2

L 32996-66 EWT(1)/EWP(m) WW

ACC NR: AP6014985 SOURCE CODE: UR/0170/66/010/005/0584/0591

64

B

AUTHOR: Leont'yev, A. I.; Fedorov, V. K.

ORG: Institute of Construction Physics, Moscow (Institut stroitel'noy fiziki, Moskva)

TITLE: Experimental investigation of convective heat transfer in the movement of a gas in the inlet section of a cylindrical tube

SOURCE: Inzhenerno-fizicheskiy zhurnal, v. 10, no. 5, 1966, 584-591

TOPIC TAGS: heat transfer, gas flow, thermodynamic analysis

ABSTRACT: The experimental section consisted of a stainless steel tube with an outer diameter of 30 mm, an inside diameter of 24.3 mm, and a length of 1052 mm. A diagram of the equipment is given. All measurements were made under steady state conditions. Experiments were made at three values of the Mach number at the inlet of the tube: 0.28, 0.36, and 3. The temperature factor $\bar{T}_{CT}$ varied from 1 to 2.05 at q_{CT} = const. The following parameters were measured: p_o, the stagnation pressure at the inlet of the tube; p, the distribution of the static pressure along the length of the tube; T_{CT}, the temperature distribution at the wall over the length of the tube; T_o, the stagnation temperature at the inlet

Card 1/2

UDC: 536.25

ACC NR: AT6021839 (A) SOURCE CODE: UR/0000/65/000/000/0118/0124

AUTHOR: Kutaleladze, S. S.; Leont'yev, A. I.; Mamontova, N. N.; Moskvicheva, V. N.; Shtokolov, L. S.

ORG: Institute of Thermophysics, Siberian Branch AN SSSR (Institut teplofiziki SO AN SSSR)

50
B+1

TITLE: Hydrodynamic theory of the heat transfer crisis in forced flow of a boiling liquid. The crisis at high flow rates and a zero vapor content in the flow

SOURCE: Teplo- i massoperenos. t. III: Teplo- i massoperenos pri fazovykh prevrashcheniyakh (Heat and mass transfer. v. 3: Heat and mass transfer in phase transformations). Minsk, Nauka i tekhnika, 1965, 118-124

TOPIC TAGS: boiling, heat transfer, hydrodynamic theory

ABSTRACT: From the theory of the limiting friction laws in the turbulent boundary layer it follows that when the Reynolds number approaches infinity, the critical injection in a homogeneous flow is equal to

$$j_{кр} = 2 c_{f0} \gamma W_0. \quad (1)$$

Card 1/2

L 40831-66

ACC NR: AT6021839

We assume that the amount of liquid ejected from the boundary layer region in the moment of crisis is

$$j_* = 2 c_{f0} \gamma' W_0 (1 - \varphi_*), \qquad (2)$$

where φ_* is the volumetric vapor content of the boundary layer region, and the energy required for this ejection comes from the loss of kinetic energy from the vapor stream, that is

$$\frac{j_*^2}{\gamma'} = \left(\frac{q_{cr}}{\varphi_* r \gamma''}\right)^2 \gamma'. \qquad (3)$$

Then

$$q_{cr} = 2 c_{f0} \varphi_* (1 - \varphi_*) r \sqrt{\gamma' \gamma''}\, W_0. \qquad (4)$$

On the above basis, the article considers mathematically the effect of underheating of the core of the flow up to the saturation temperature, and the effect of the vapor content of the flow. Orig. art. has: 19 formulas and 3 figures.

SUB CODE: 20/ SUBM DATE: 09Dec65/ ORIG REF: 016/ OTH REF: 009

Card 2/2 MLP

L 08825-67 EWT(1)/EWP(m) WW

ACC NR: AP6021363

SOURCE CODE: UR/0207/66/000/003/0149/0153

AUTHOR: Volchkov, E. P. (Novosibirsk); Kutateladze, S. S. (Novosibirsk); Levchenko, V. Ya. (Novosibirsk); Leont'yev, A. I. (Novosibirsk)

ORG: none

38

TITLE: Baffle cooling in the case of a current blowing into a turbulent boundary layer through multi-aperture and grid grates

SOURCE: Zhurnal prikladnoy mekhaniki i tekhnicheskoy fiziki, no. 3, 1966, 149-153

TOPIC TAGS: turbulent flow, boundary layer, cooled boundary layer

ABSTRACT: An analytic method is proposed for determining the effectiveness of baffle cooling of a plane thermally insulated wall when a cooling gas is delivered through grates. Results obtained for the cooling effect of a gas passing through a single aperture are shown to be applicable to the more complex problem. Equations for the degree of energy and momentum loss are introduced for the second aperture as an extension of those for the first. An estimate is then made of the effectiveness of heat protection, the measure of which is taken to be the temperature of the insulated wall. These estimates are shown to agree with experimental data. Orig. art. has: 23 formulas, 6 figures.

SUB CODE: 13/ SUBM DATE: 21Apr65/ ORIG REF: 006/ OTH REF: 002

Card 1/1 nst

ACC NR: AP6021571 (A) SOURCE CODE: UR/0131/66/000/003/0042/0048

AUTHOR: Leonov, A. I.; Keler, E. K.; Andreyeva, A. B.

ORG: Institute of Silicate Chemistry im. I. V. Grebenshchikov, AN SSSR (Institut khimii silikatov AN SSSR)

TITLE: Effect of a gaseous medium on chemical reactions and polymorphic transformations in the system zirconium dioxide-cerium oxides

SOURCE: Ogneupory, no. 3, 1966, 42-48

TOPIC TAGS: cerium compound, zirconium compound, gas, oxygen, refractory compound, CHEMICAL VALENCE, CHEMICAL STABILIZER

ABSTRACT: The effect of partial pressure of oxygen on valency changes of Ce in the system ZrO_2-Ce oxides and on the physico-chemical properties of refractories in this system is investigated. CeO_2 is the most effective stabilizer of ZrO_2. In the system ZrO_2-CeO_2 solid solutions of three types take form —monoclinic, tetragonal and cubic. CeO_2, which is present in the solid solution in ZrO_2, changes to trivalent state at high temperatures in a reducing atmosphere (H_2, CO, NH_3), in a flow of inert gases (Ar, Ne) and in flame-furnace atmospheres

Card 1/2

UDC: 546.831:666.76

Card 2/2

ACC NR: AP7000058 SOURCE CODE: UR/0207/66/000/005/0123/0125

AUTHOR: Kutateladze, S. S. (Novosibirsk); Leont'yev, A. I. (Novosibirsk); Mironov, B. P. (Novosibirsk)

ORG: none

TITLE: Calculation of turbulent heat transfer on a semipermeable surface with injection of foreign gas

SOURCE: Zhurnal prikladnoy mekhaniki i tekhnicheskoy fiziki, no. 5, 1966, 123-125

TOPIC TAGS: turbulent heat transfer, semipermeable surface, sweat cooling, subsonic flow

ABSTRACT: A method is presented for calculating the heat transfer on a semipermeable surface under conditions of subsonic flow with foreign gas injection. The method is based on the solution of the energy equation and the use of the asymptotic theory of the turbulent boundary layer. Figure 1 shows the comparison of the calculated results with experimental data obtained by Tefik, Eckert, et al. (Thermal diffusion effects on energy transfer in turbulent boundary layer with helium injection. Proc. of the 1962 heat transfer and fluid. Mechanics Institute, Stanford University Press, 1962).

ACC NR: AP7000058

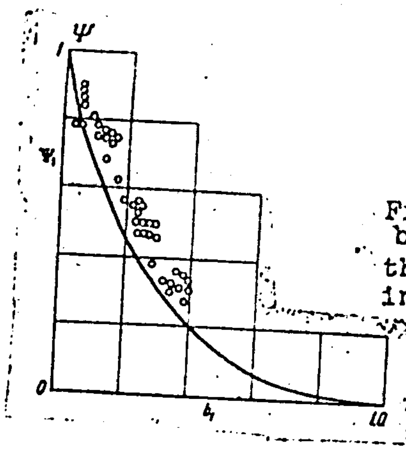

Fig.1. Variation of ψ_1 with b_1 (ψ_1, - function of the Stanton numbers; b_1 - injection parameter.

Figure 2 shows the rate of gas injection for the case where c_p is different for the injected and main gases.

Card 2/3

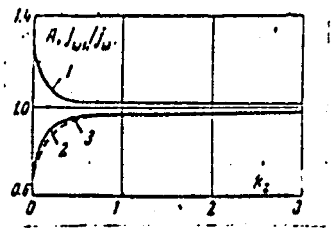

Fig. 2. Variation of j_{w1}/j_w with k_2. (j_w - rate of gas injection)

The calculation was performed for: k_2=0.005--6.0; R=0.25; c_{p_1}/c_{p_0}= 0.25; ψ=0.303--0.9, where k_2 is a function of the wall and gas temperatures, and c_{p_0} and c_{p_1} are the specific heats of the main and injected gases, respectively. The obtained results show that the rate of injected gas is only slightly affected by the physical properties of injected and main gases.
Orig. art. has: 2 figures and 20 formulas. [WA-88]

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